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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/032,698

12/27/2001

Peidong Yang

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07/02/2004

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EXAMINER

WONG, ERIC K

ART UNIT

PAPER NUMBER

2874

DATE MAILED: 07/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/032,698

Applicant(s)

YANG ET AL.

AK

Examiner

Eric Wong

Art Unit

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 April 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 and 21-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 and 21-27 is/are rejected.
- 7) ☒ Claim(s) 22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 4/16/04 have been fully considered but they are not persuasive. Applicant argues that Leiber does not teach or suggest illumination of an opto-electronic device to induce a surface interaction resulting in a change in conduction characteristic in the manner claimed. Applicant states that Leiber discusses properties associated with the nanowire that can be used by detectors and examples of stimuli, but that Leiber does not teach illumination of a nanowire by electromagnetic radiation will in any way affect the conductivity of the nanowire.

Furthermore, applicant argues that Leiber fails to discuss a composition to affect a change in conduction characteristic of a nanowire depending on illumination. Examiner respectfully disagrees.

Leiber discusses stimuli such as electromagnetic radiation that produces a change in the signal resulting from differences in such properties as conductivity. Although Leiber does not specifically claim the use of O₂, NO₂, H₂O, NO or SO₂, these compounds are not specifically claimed in claim 19.

As to the argument for claim 27, as noted in the previous office action, Leiber discusses in paragraph 136 that resistance changes effected by electro-magnetic radiation allows the detector to detect signal changes in a sensor.

As to the arguments for claims 2-18 and 21-26, which depend upon claims 1 and 19, are rejected for similar rationale as discussed above for claims 1 and 19.

Claim Rejections - 35 USC § 102

Art Unit: 2874

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 1-4, 6-7, 10-13, 15, 19, 21, 23-25 and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by United States Patent Application Publication 2002/0117659 to Lieber et al.

As to claims 1, 4, 15, Lieber discloses in the abstract and paragraph 63 and 65, a nanowire switching device comprising:

- A nanowire structure comprising an elongated member having a cross-sectional diameter ranging from about 1 nanometer but less than 300 nanometers;
- A first terminal coupled to a first portion of the nanowire structure;
- A second terminal coupled to a second portion of the nanowire structure, the second portion of the nanowire structure being disposed spatially from the first portion of the nanowire structure; and
- An active surface structure comprising a first chemical species coupled to the nanowire structure, the active surface structure extending from the first portion to the second portion along the elongated member, whereupon the nanowire structure has a first electrical conductivity value as measured between the first terminal and the second terminal while the active surface is subjected to a second environment, the second environment being different from the first, wherein the

second environment releases a portion of the first chemical species from the active surface structure.

- Where said environment is of electromagnetic radiation illumination (paragraph 136).

As to claim 2, the device is a switch, sensor, chemical sensor, photo-detector, or opto-electronic device (Paragraph 162).

As to claim 3, the device is a humidity or oxygen sensor (Paragraph 162).

As to claim 6, the cross-sectional diameter ranges from 1nm to 500nm (Paragraph 63).

As to claim 7, the structure has an aspect ratio of 10:1000 (Paragraph 79).

As to claims 10, 11, 24 and 25, the semiconductor material is ZnO, SiGe, Si, Ge, GaN, PbSe, or PbS (Paragraph 79).

As to claim 12, the material is spatially separated (Paragraph 79).

As to claim 13, the nanowire structure is homogeneous (Paragraph 87 / uniform structure)

As to claims 19 and 21, such a device as described above also has a first chemical species attached to the structure where an illuminating energy changes the structure from a first to a second electrical state based on magnetic dopants (Paragraph 136).

As to claims 23 and 27, the energy is electro-magnetic (paragraph 136).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leiber as applied to claim 1 above. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use an active surface between 10% and 90%, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

5. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leiber as applied to claim 1 above.

Leiber discloses a nanowire sensor device, but fails to explicitly disclose its operation at a temperature range between 0-100 degrees Celsius. It would have been obvious to one having ordinary skill in the art at the time the invention was made to produce a device with an operable temperature range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

6. Claims 8, 9 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leiber as applied to claim 1 and 19 above.

Leiber discloses a nanowire switching device comprising a nanowire structure, but fails to explicitly disclose that the nanowire is made of a material that is monocrystalline or polycrystalline. Use of a crystal material is common in nanowire construction. Although Leiber does not disclose the material used in fabricating the nanowire, one skilled in the art would recognize that use of either a monocrystalline or polycrystalline material would yield equal results.

It would have been obvious to one skilled in the art at the time the invention was made to have been able to draw a conclusion that the nanowire structure of Leiber can be made of either monocrystalline or polycrystalline as these are common materials for the manufacture of nanowire.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leiber as applied to claim 1 above.

Leiber discloses a nanowire structure, but fails to explicitly disclose a nanowire that is heterogeneous in texture.

One skilled in the art at the time the invention was made would be able to recognize the need for a heterogeneous texture in order to make it easier to couple binding agents.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use a heterogeneous texture for a nanowire to make it easier to couple binding agents.

8. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Leiber as applied to claim 19 above.

Leiber discloses a nanowire structure with a first chemical species, but fails to explicitly disclose the use of O₂, NO₂, H₂O, NO or SO₂ as a chemical species. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a chemical species selected from oxygen, NO₂, H₂O, NO and SO₂, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Claim Objections

9. Claim 22 is objected to because of the following informalities: The word “or” should be replaced with –and–. Appropriate correction is required.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric Wong whose telephone number is 571-272-2363. The examiner can normally be reached on Monday through Friday, 830AM - 430PM.

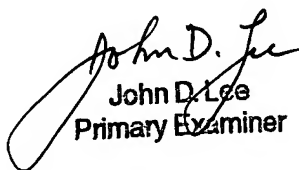
If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Rodney Bovernick can be reached on 571-272-2344. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2874

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



EW



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Primary Examiner